

**$\Lambda(1690)$  3/2<sup>-</sup>** $I(J^P) = 0(\frac{3}{2}^-)$  Status: \*\*\*

The measurements of the mass, width, and elasticity published before 1974 are now obsolete and have been omitted. They were last listed in our 1982 edition Physics Letters **111B** 1 (1982).

 **$\Lambda(1690)$  MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1685 to 1695 (<math>\approx 1690</math>) OUR ESTIMATE</b>			
1695.7 $\pm$ 2.6	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
1690 $\pm$ 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
1692 $\pm$ 5	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
1690 $\pm$ 5	GOPAL	77	DPWA $\bar{K}N$ multichannel
1690 $\pm$ 3	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
1689 $\pm$ 1	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1687 or 1689	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
1692 $\pm$ 4	CARROLL	76	DPWA Isospin-0 total $\sigma$

 **$\Lambda(1690)$  WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>50 to 70 (<math>\approx 60</math>) OUR ESTIMATE</b>			
67.2 $\pm$ 5.6	KOISO	85	DPWA $K^- p \rightarrow \Sigma \pi$
61 $\pm$ 5	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
64 $\pm$ 10	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
60 $\pm$ 5	GOPAL	77	DPWA $\bar{K}N$ multichannel
82 $\pm$ 8	HEPP	76B	DPWA $K^- N \rightarrow \Sigma \pi$
60 $\pm$ 4	KANE	74	DPWA $K^- p \rightarrow \Sigma \pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
62 or 62	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel
38	CARROLL	76	DPWA Isospin-0 total $\sigma$

 **$\Lambda(1690)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1 N \bar{K}$	20–30 %
$\Gamma_2 \Sigma \pi$	20–40 %
$\Gamma_3 \Lambda \pi \pi$	$\sim 25$ %
$\Gamma_4 \Sigma \pi \pi$	$\sim 20$ %
$\Gamma_5 \Lambda \eta$	
$\Gamma_6 \Sigma(1385)\pi$ , S-wave	

The above branching fractions are our estimates, not fits or averages.

 **$\Lambda(1690)$  BRANCHING RATIOS**

The sum of all the quoted branching ratios is more than 1.0. The two-body ratios are from partial-wave analyses, and thus probably are more reliable than the three-body ratios, which are determined from bumps in cross sections. Of the latter, the  $\Sigma \pi \pi$  bump looks more significant. (The error given for the  $\Lambda \pi \pi$  ratio looks unreasonably small.) Hardly any of the  $\Sigma \pi \pi$  decay can be via  $\Sigma(1385)$ , for then seven times as much  $\Lambda \pi \pi$  decay would be required. See "Sign conventions for resonance couplings" in the Note on  $\Lambda$  and  $\Sigma$  Resonances.

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.2 to 0.3 OUR ESTIMATE</b>			
0.23 $\pm$ 0.03	GOPAL	80	DPWA $\bar{K}N \rightarrow \bar{K}N$
0.22 $\pm$ 0.03	ALSTON-...	78	DPWA $\bar{K}N \rightarrow \bar{K}N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.24 $\pm$ 0.03	GOPAL	77	DPWA See GOPAL 80
0.28 or 0.26	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel

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$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi$				$(\Gamma_1 \Gamma_2)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
-0.34 ± 0.02	KOISO 85	DPWA	$K^- p \rightarrow \Sigma\pi$	
-0.25 ± 0.03	GOPAL 77	DPWA	$\bar{K}N$ multichannel	
-0.29 ± 0.03	HEPP 76B	DPWA	$K^- N \rightarrow \Sigma\pi$	
-0.28 ± 0.03	LONDON 75	HLBC	$K^- p \rightarrow \Sigma^0 \pi^0$	
-0.28 ± 0.02	KANE 74	DPWA	$K^- p \rightarrow \Sigma\pi$	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
-0.30 or -0.28	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel	

  

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\eta$				$(\Gamma_1 \Gamma_5)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
0.00 ± 0.03	BAXTER 73	DPWA	$K^- p \rightarrow \text{ neutrals}$	

  

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Lambda\pi\pi$				$(\Gamma_1 \Gamma_3)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.25 ± 0.02	<sup>2</sup> BARTLEY 68	HDBC	$K^- p \rightarrow \Lambda\pi\pi$	

  

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma\pi\pi$				$(\Gamma_1 \Gamma_4)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
0.21	ARMENTEROS68C	HDBC	$K^- N \rightarrow \Sigma\pi\pi$	

  

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Lambda(1690) \rightarrow \Sigma(1385)\pi$ , S-wave				$(\Gamma_1 \Gamma_6)^{1/2} / \Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
+0.27 ± 0.04	PREVOST 74	DPWA	$K^- N \rightarrow \Sigma(1385)\pi$	

### $\Lambda(1690)$ FOOTNOTES

- <sup>1</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.  
Another  $D_{03}$   $\Lambda$  at 1966 MeV is also suggested by MARTIN 77, but is very uncertain.  
<sup>2</sup> BARTLEY 68 uses only cross-section data. The enhancement is not seen by PREVOST 71.

### $\Lambda(1690)$ REFERENCES

KOISO 85	NP A433 619	H. Koiso <i>et al.</i>	(TOKY, MASA)
PDG 82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
GOPAL 80	Toronto Conf. 159	G.P. Gopal	(RHEL) IJP
ALSTON-... 78	PR D18 182	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
Also	PRL 38 1007	M. Alston-Garnjost <i>et al.</i>	(LBL, MTHO+) IJP
GOPAL 77	NP B119 362	G.P. Gopal <i>et al.</i>	(LOIC, RHEL) IJP
MARTIN 77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also	NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also	NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
CARROLL 76	PRL 37 806	A.S. Carroll <i>et al.</i>	(BNL) I
HEPP 76B	PL 65B 487	V. Hepp <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
LONDON 75	NP B85 289	G.W. London <i>et al.</i>	(BNL, CERN, EPOL+)
KANE 74	LBL-2452	D.F. Kane	(LBL) IJP
PREVOST 74	NP B69 246	J. Prevost <i>et al.</i>	(SACL, CERN, HEID)
BAXTER 73	NP B67 125	D.F. Baxter <i>et al.</i>	(OXF) IJP
PREVOST 71	Amsterdam Conf.	J. Prevost	(CERN, HEID, SACL)
ARMENTEROS 68C	NP B8 216	R. Armenteros <i>et al.</i>	(CERN, HEID, SACL) I
BARTLEY 68	PRL 21 1111	J.H. Bartley <i>et al.</i>	(TUFTS, FSU, BRAN) I

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